

Vatican and other Italian libraries with a view to further light being thrown upon this question.

MR. W. CHANDLER ROBERTS-AUSTEN will give the discourse on Friday evening, May 11, at the Royal Institution in place of Mr. W. H. Barlow, who is unwell.

THE additions to the Zoological Society's Gardens during the past week include a Bonnet Monkey (*Macacus sinicus* ♀), from India, presented by Mr. Lionel H. Hanbury; a Macaque Monkey (*Macacus cynomolgus* ♂), from Burma, presented by Mrs. G. E. Buchanan; a Scarlet Ibis (*Eudocimus ruber*), a Roseate Spoonbill (*Platalea ajaja*), from Brazil, presented by Mr. Charles Booth; a Common Kestrel (*Tinnunculus alaudarius*), British, presented by Mr. H. Weetman, F.Z.S.; a Hoffmann's Sloth (*Choloepus hoffmanni*), from Panama, deposited; three Lined Finches (*Spermophila lineola*), from South America, purchased; two Persian Gazelles (*Gazella subgutturosa* ♂ ♀), two Chinchillas (*Chinchilla lanigera*), born in the Gardens.

ASTRONOMICAL PHENOMENA FOR THE WEEK 1888 MAY 6-12.

(FOR the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

At Greenwich on May 6

Sun rises, 4h. 24m.; souths, 11h. 56m. 25' 9s.; sets, 19h. 29m.; right asc. on meridian, 2h. 55' 5m.; decl. 16° 44' N. Sidereal Time at Sunset, 10h. 29m.
Moon (New on May 11, 1h.) rises, 3h. 15m.; souths, 8h. 49m.; sets, 14h. 34m.; right asc. on meridian, 23h. 47' 5m.; decl. 5° 36' S.

Planet.	Rises.		Souths.		Sets.		Right asc. and declination on meridian.	
	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	°
Mercury..	4 16	...	11 36	...	18 56	...	2 35' 1	14 29 N.
Venus ...	3 56	...	10 49	...	17 42	...	1 47' 9	9 35 N.
Mars ...	16 9	...	21 51	...	3 33*	...	12 51' 5	4 15 S.
Jupiter ...	20 53*	...	1 9	...	5 25	...	16 6' 7	19 52 S.
Saturn ...	9 16	...	17 13	...	1 10*	...	8 12' 5	20 35 N.
Uranus ...	16 13	...	21 52	...	3 31*	...	12 52' 3	4 52 S.
Neptune..	5 7	...	12 50	...	20 33	...	3 49' 6	18 25 N.

* Indicates that the rising is that of the preceding evening and the setting that of the following morning.

May.	h.	
9	9	Venus in conjunction with and 3° 50' north of the Moon.
10	22	Mercury in conjunction with and 5° 6' north of the Moon.
11	0	Mercury in superior conjunction with the Sun.

Saturn, May 6.—Outer major axis of outer ring = 40"·2; outer minor axis of outer ring = 14"·3; southern surface visible.

Variable Stars.

Star	R.A.	Decl.	h. m.	M
R Andromedæ ...	0 18' 1	37 57 N.	May 10,	M
U Cephei ...	0 52' 4	81 16 N.	"	7, 2 19 m
♄ Geminorum ...	6 57' 5	20 44 N.	"	12, 1 58 m
♌ Libræ ...	14 55' 0	8 4 S.	"	10, 0 0 m
U Coronæ ...	15 13' 6	32 3 N.	"	8, 21 12 m
U Ophiuchi... ..	17 10' 9	1 20 N.	"	7, 20 39 m
		and at intervals of	20 8	
Z Sagittarii... ..	18 14' 8	18 55 S.	"	8, 0 0 m
U Sagittarii... ..	18 25' 3	19 12 S.	"	7, 2 0 m
			"	10, 1 0 M
η Aquilæ ...	19 46' 8	0 43 N.	"	8, 0 0 M
T Aquarii ...	20 44' 0	5 34 S.	"	7, m
♁ Cephei ...	22 25' 0	57 51 N.	"	8, 23 0 m

M signifies maximum; m minimum.

Meteor-Showers.

R.A. Decl.

Near ε Crateris ...	170	10 S.	Very slow.
" α Coronæ ...	232	27 N.	Rather faint and slow.
" ζ Draconis ...	260	64 N.	Rather slow.

GEOGRAPHICAL NOTES.

THE *Mouvement Géographique* contains details of Lieut. Van Gèle's recent exploration of the River Mobangi, the great tributary of the north bank of the Congo, which discharges a little below the equator. It will be remembered that the Rev. George Grenfell succeeded in making his way up the river as far as 4° N. latitude, where he was stopped by the Zongo rapids. Lieut. Van Gèle started on October 26 last, and reached the rapids on November 21. There are six of them, covering a space of 34 miles. They are situated in what is really a mountain gorge, the mountains, in gentle slopes, coming down to the river banks. The steamer *En Avant* had to be unloaded several times and dragged up the rapids. The spaces between the rapids are mostly covered with islands, with great bars of rock stretching between them. The country on each side is described as being fine, fertile, and covered with villages. The people here are all of the same tribe; head shaved except at the nape, bristling moustaches, and no tattooing. Above the middle falls, the Bakombé inhabit the country. These arrange the hair in *queues*, some of which are over 6 feet long. From the upper end of the falls the river continues in a north-east direction for about 32 miles, when it rounds to the east. It has a breadth of about 2600 feet, and the navigation is easy, the average depth being 14 feet. The easterly direction is maintained as far as the *En Avant* went, about 172 miles further. The mountains disappear from the right bank, and the left is marked by low hills, with grassy plains and woods alternating. The villages are at some distance from the river, but the people came down to the vessel in crowds all the way up, and were perfectly friendly until the last few days. Over the whole course tropical cultures of every kind were abundant, as well as sheep, goats, and fowls. The natives on the right bank belong to the Buraka and Maduru tribes; those on the right to the Bakangi, the Mombate, and the Banzy. They mostly shave the head so as to leave a triangle of hair, with the forehead as base. The ears are enormously elongated with heavy copper rings. The river here is covered with islands, mostly cultivated and inhabited. Among the Banzy the huts have the shape of huge conical extinguishers, resting on a circular wall about 2 feet high. These huts are ranged in circular rows, forming broad streets, well kept, and with a common meeting-house in the centre. Each hut is divided into two apartments, one used for sleeping. Iron is admirably worked into all sorts of implements, weapons, and ornaments. Ivory is abundant, but used only for bracelets, anklets, and *pelelé* or lip-ornaments. About 100 miles above the Zongo rapids a second is met with, at Bemay. The vessel succeeded in passing it, and a third 25 miles further up. Just above Bemay, the only tributary met with from the Zongo rapids upwards—the Bangasso—discharges into the right bank of the Mobangi. Above the river the country is densely peopled by the Mombongo and Yakoma, and these showed themselves distinctly hostile to the expedition. There were unfortunately several conflicts, in which lives were lost on both sides. Rocks and sand-banks obstructed the navigation, and after getting as far as 21° 55' E., Lieut. Van Gèle turned back, making his way downwards with some difficulty, as the river had lowered about 10 feet. He arrived at Equator Station on February 1. The river was about 8000 feet wide at the furthest point, and covered with islands, mostly inhabited. On the north bank of the river, one village extended along a distance of 3 miles. As Dr. Junker's furthest point on the Wellé was 22° 55' E., only 1° of longitude separates his point from Van Gèle's furthest, or about 68 miles. As they are both on the same line of latitude, there can be no doubt that the Mobangi and the Wellé are the same river.

FROM an official Report by Mr. Percy Smith, Assistant Surveyor-General of New Zealand, on a visit to the Kermadec Islands, in August last, we glean some information as to this recent annexation to the British dominions. The group is situated between the parallels of 29° 10' and 31° 10' S. lat., and between the meridian of 177° 45' and 179° W. long. There are four islands, with some outlying islets and rocks, the most northerly, Raoul or Sunday Island, being 674 miles north-east of Auckland. The islands are all volcanic; in two of them, indeed, signs of volcanic activity are to be seen at the present day, though on a limited scale. They appear to be situated on an oceanic plateau which extends from New Zealand to the Tonga Group, on which soundings are obtained at depths much less than in the adjacent areas, but still so great as to show that the islands form, as it were, the tops of volcanic cones rising to

a great height above their bases. The group is situated on the north easterly projection of the axis of the volcanic zone of the Bay of Plenty, which, continued still further north eastward, strikes the Tonga and Samoan Groups, places where volcanic action is still going on. Two, if not three, volcanic disturbances have taken place at the Kermadec Islands within recent years, and earthquakes were very frequent there at one time; but since the eruption of Tarawera, June 10, 1886, they have ceased entirely. On Sunday Island the most prominent feature is the large crater near the centre of the island. It is $1\frac{1}{4}$ mile long by $1\frac{1}{4}$ mile wide; its walls are generally over 1000 feet high. Steam escapes occasionally from the Green Lake on the south side, and from the crevices in the precipitous cliffs of Denham Bay, while warm water oozes out of the sand on the north coast.

DR. HANS MEYER, who recently ascended Kilimanjaro, and Dr. O. Baumann, who accompanied Dr. Lenz up the Congo, are preparing to start on a new expedition to East Africa. Their object will be to make a thorough exploration and survey of the whole of the Kilimanjaro region.

RECENT issues of the journals published in French Indo-China, contain an interesting letter from M. Gauthier, describing a journey down the Meikong River, from Luang Prabang into Cambodia. The traveller spent forty days on the journey, and passed twenty cataracts, in one of which his boat was almost dashed to pieces. He visited the Laos States, and describes its inhabitants as doing nothing except laughing, smoking, and singing throughout the day, such business as there is being wholly in the hands of the Chinese.

OUR ELECTRICAL COLUMN.

GOUY has found that the attraction between two electrified surfaces maintained at a constant potential-difference is one hundred times greater in distilled water than in air.

ADMIRABLY well-equipped public electrical laboratories have been established in Paris and Vienna. When are we to see one in London?

VAN AUBEL (*Arch. de Genève*, xix. p. 105, 1888) has been studying the effect of magnetism and heat on the electric resistance of bismuth and of its alloys with lead and tin. Contrary to all other metals, the resistance of bismuth sometimes increases with reduction of temperature. He also verified the fact that the resistance of bismuth at low temperatures increases in the magnetic field. The effect is very feeble with alloys.

FOEPL (*Ann. Wiedemann*, xxiii. p. 492) has been endeavouring to prove Edlund's hypothesis that a perfect vacuum is a conductor, but has completely failed to do so. He makes the resistance of a vacuum to be three million times greater than that of copper.

MR. C. VERNON BOYS has communicated to the Royal Society some further details of his beautiful radio-micrometer. It is a thermo-electric circuit, consisting of a bar of antimony and bismuth, of small sectional area, the ends being formed by a loop of copper wire, suspended by a torsion fibre in a strong magnetic field. It is possible to observe by its means a difference of temperature of one ten-millionth of a degree Centigrade.

C. L. WEBER (*Centralblatt für Elekrotechnik*, 1887, vol. ix.), experimenting on various amalgams and alloys of tin, bismuth, lead, and cadmium, has found that many of them have a higher conductivity than that of each of their constituents.

SIRKS, of Deventer (Holland), has found a peculiar dynamical action of the current on the electrodes. An electrical current passing through a solution of CuSO_4 between two electrodes of copper, which are varnished at the back, pulls *both against* the direction of the positive stream. Independently of the concentration, if only high enough to prevent the formation of gases, the pressure at the anode and the traction at the cathode amount to nearly 1 gramme per ampere and per square metre.

ON THE COMPARISON OF THE CRANIAL WITH THE SPINAL NERVES.

THE origin of vertebrate animals is to be found according to many morphologists in those invertebrates which are composed of a series of segments, and one of the chief arguments in favour of this view has always been the fact that the spinal

nerves are arranged segmentally. It has, however, long been felt that the cranial nerves ought to give evidence of a segmental arrangement as clearly as the spinal before it is possible to speak of a segmentation based upon the arrangement of the nervous system; and indeed many ingenious tables have been manufactured by morphologists in order to bring the cranial nerves into the same system as the spinal. The failure of these attempts is to my mind due largely to the following reasons:—

1. Confusion has arisen because anatomists have been in the habit of looking upon the nervous system of the vertebrate as composed of two separate nervous systems, viz. the cerebro-spinal and sympathetic.

2. In the comparison of cranial and spinal nerves the morphologists have directed their attention too exclusively to the exits of the nerves from the central nervous system without taking into account the place of origin of the nerves in the central nervous system itself.

3. It has been assumed on insufficient grounds that the presence of ganglia in connection with motor cranial nerves indicates that the cranial nerves do not follow Bell's law, and are therefore not strictly comparable with spinal nerves.

These difficulties are all found to vanish as soon as a clear conception is obtained of what is meant by the nerves of a spinal segment.

Since the time of Charles Bell it has been recognized that a spinal nerve is formed by two roots: the one, posterior, which contains only afferent fibres, i.e. fibres which convey impulses from the periphery to the central nervous system; and the other, anterior, containing exclusively efferent fibres which convey impulses from the central nervous system to the periphery. In correspondence with these two sets of fibres the grey matter of the spinal cord is divided into two portions, named respectively the posterior and anterior horns. Another division, however, exists of almost equal importance, which is not so generally recognized, viz. a division both of the nerve fibres and their centres of origin in the grey matter for the purpose of supplying the internal and external portions of the body—a division of nerves and nerve centres into splanchnic and somatic as well as into afferent and efferent. The centres of origin of the splanchnic nerves are situated in the internal part of the grey matter of the spinal cord, being arranged in groups in the neighbourhood of the central canal, and the nerves themselves supply the viscera and internal surfaces of the body, together with certain muscles of respiration and deglutition which are derived from special embryonic structures known as the lateral plates of mesoblast. On the other hand, the centres of origin of the somatic nerves are situated in the outlying horns of grey matter, and the nerves themselves supply the integument and the ordinary muscles of locomotion, &c.,—muscles which are derived from the muscle-plates or myotomes.

Further, these two sets of nerves are arranged in the posterior and anterior roots in a special manner, the significance of which is the key to the whole question of the segmental nature of the cranial nerves. In the posterior roots the afferent fibres of both splanchnic and somatic systems pass into the spinal ganglion, which is always situated on the nerve root soon after its exit from the central nervous system; so that we may speak of the afferent fibres of both systems as being in connection with a ganglion which is stationary in position. In the anterior roots, on the other hand, we find that some of the fibres are in connection with no ganglia, while others are in connection with ganglia which are not fixed in position, but are found at various distances from the central nervous system (it is this system of ganglia which has hitherto been looked upon as forming a separate nervous system, viz. the sympathetic system), so that the fibres of the anterior root, all of which are efferent, are divisible into a ganglionated and a non-ganglionated group, of which the ganglionated group belongs to the splanchnic system, and is characterized by the smallness in the size of its fibres, while the non-ganglionated group is composed both of somatic and splanchnic nerves, and forms the ordinary large-sized motor nerve fibres of the voluntary striped muscles both of respiration and deglutition as well as of locomotion.

Again, it has been shown that these efferent ganglia are in reality offshoots from a primitive ganglion mass situated on the spinal nerves into which both afferent and efferent fibres ran.

We see, then, that both roots of a fully formed spinal nerve are ganglionated, so that the presence of a ganglion is no longer the sign of a posterior root, and we must define a spinal nerve as being formed by—